

WEATHER NOTES

ANALYSIS OF THE SQUALLY WAVE IN THE ATLANTIC, JULY 18-19, 1957

A large area of squalls associated with an easterly wave developed in the Atlantic Ocean early on July 17, 1957. The easterly wave had been analyzed and charted several days earlier moving westward at about 20 m. p. h. At 1200 GMT on July 17 the zone of squally weather was localized about 700 miles east of Trinidad, British West Indies, near latitude 10° - 12° N., longitude 46° - 48° W.

For several days previous to July 17 the Intertropical Convergence Zone had shifted northward from its normal position near the Guianas coastal area to a position about latitude 8.5° N., where it was intersected by the easterly wave mentioned above. Vessel reports in the vicinity during the 16th and 17th of July indicated evidence of a slight circulation. Vessels to the south of the area were reporting southeast to southwest winds 12 to 20 kt., while other ships to the north and west reported northeast winds 20 to 25 kt. Almost all vessels reported rain and heavy showers during this period.

It was decided that the situation warranted further investigation and in view of the proximity of the system to the Windward Islands, low-level reconnaissance was requested. The disturbed area was beyond the range of U. S. Navy aircraft in Puerto Rico, but the Miami Hurricane Center was successful in diverting the Gull-Papa flight to search the area that afternoon. The Gull-Papa search flight, which was conducted at the 700-mb. level, reported unusually strong winds of 45 to 60 kt. from the southeast at flight level in the vicinity of latitude 11° - 15° N., longitude 49° - 51° W. At the same time, surface winds were of the order of 20 kt. from the northeast indicating the presence of the low level perturbation to the east. A dropsonde released at 1900 GMT near 9.8° N., 50.4° W. indicated a surface pressure of 1006 mb., which is lower than normal for that area. The information reported by the reconnaissance aircraft, although not conclusive, revealed the presence of a suspicious situation and arrangements for low-level reconnaissance the following morning, July 18, were completed. In addition, a request for special ship observations at 3-hourly intervals, beginning at 1200 GMT July 18, in the area 10° - 20° N. and 45° - 60° W. was sent out.

The normal concern for the safety of interests in the Windward Islands was increased by the presence of a cruiser section of the U. S. Atlantic Fleet on a visit at Trinidad.

The narrow confines of the Gulf of Paria are too small for maneuvering safely in case of hurricane development.

The analysis at the 700-mb. level at 1200 GMT, July 17, indicated a trough in the mid-Atlantic near 42° W., associated with a cold Low in the central Atlantic farther to the north, and a weaker, almost stationary, trough oriented north-south near the Lesser Antilles, but some distance to the west of the low-level perturbation. The subtropical high pressure cell was located far to the east near the Cape Verde Islands. This general situation persisted at the 700-mb. level through the period until 0000 GMT, July 19. At the 500-mb. level the trough in the central Atlantic associated with the cold Low to the north was clearly indicated, but farther west the situation was somewhat different. An anti-cyclonic cell was centered over the Lesser Antilles and extended about 600 miles east and west from this central position. The flow at the 200-mb. level, which gives perhaps the best clue for the failure of the perturbation to intensify, is illustrated in figures 1 and 2. On July 19, 1200 GMT (fig. 1) the analysis indicated a cyclonic cell over eastern Cuba, with troughs extending to the west, south, and southeast across the Caribbean Sea. This cyclonic situation over the Greater Antilles had persisted for some time. Air flow over the Windward Islands during this period showed an interesting sequence of events. Since July 17 the presence of a northerly flow at Trinidad indicated the presence of a trough or cyclonic cell in the area to the east. The contour analysis over the region also pointed to a low pressure area in that zone; but, as is usually the case, the exact nature and position of the center was unknown. The situation persisted during July 18, but on July 19, 1200 GMT, a change in the winds at Trinidad and also at St. Lucia indicated that the cyclonic center was approaching and would pass Trinidad to the south. At this time a closed Low was located just southeast of the station. Continued veering of the winds at Trinidad on July 20, 0000 GMT (fig. 2), confirmed the westward motion of the low center. This series of events gave the first exact picture of the flow in the area. It was then possible to trace the motion of the cyclone backward and make some inferences in regard to the flow prevalent over the surface perturbation during July 18.

In the meantime the surface chart at 1200 GMT on July 18, illustrated in figure 3,

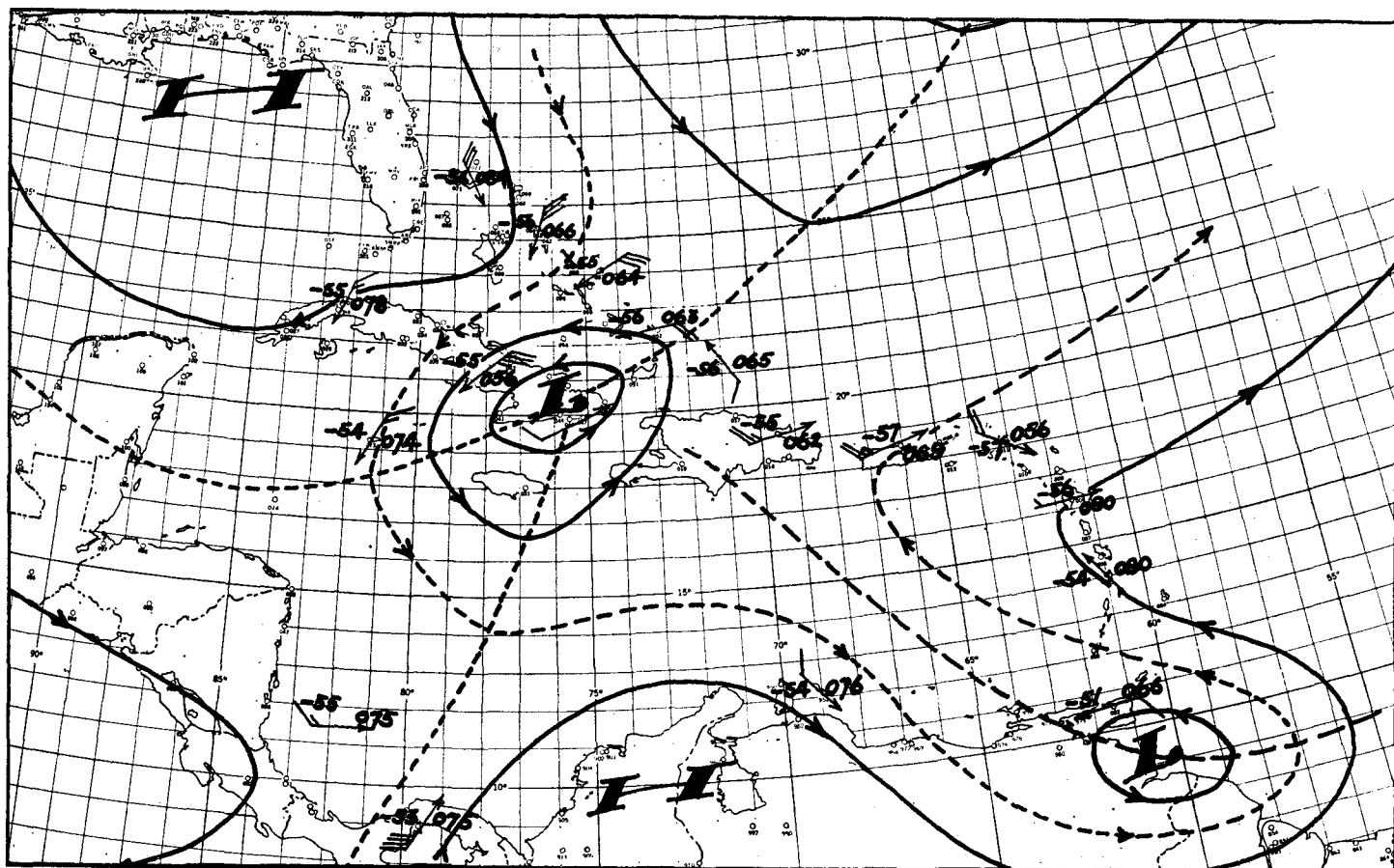


FIGURE 1.—200-mb. flow pattern, 1200 GMT July 19, 1957.

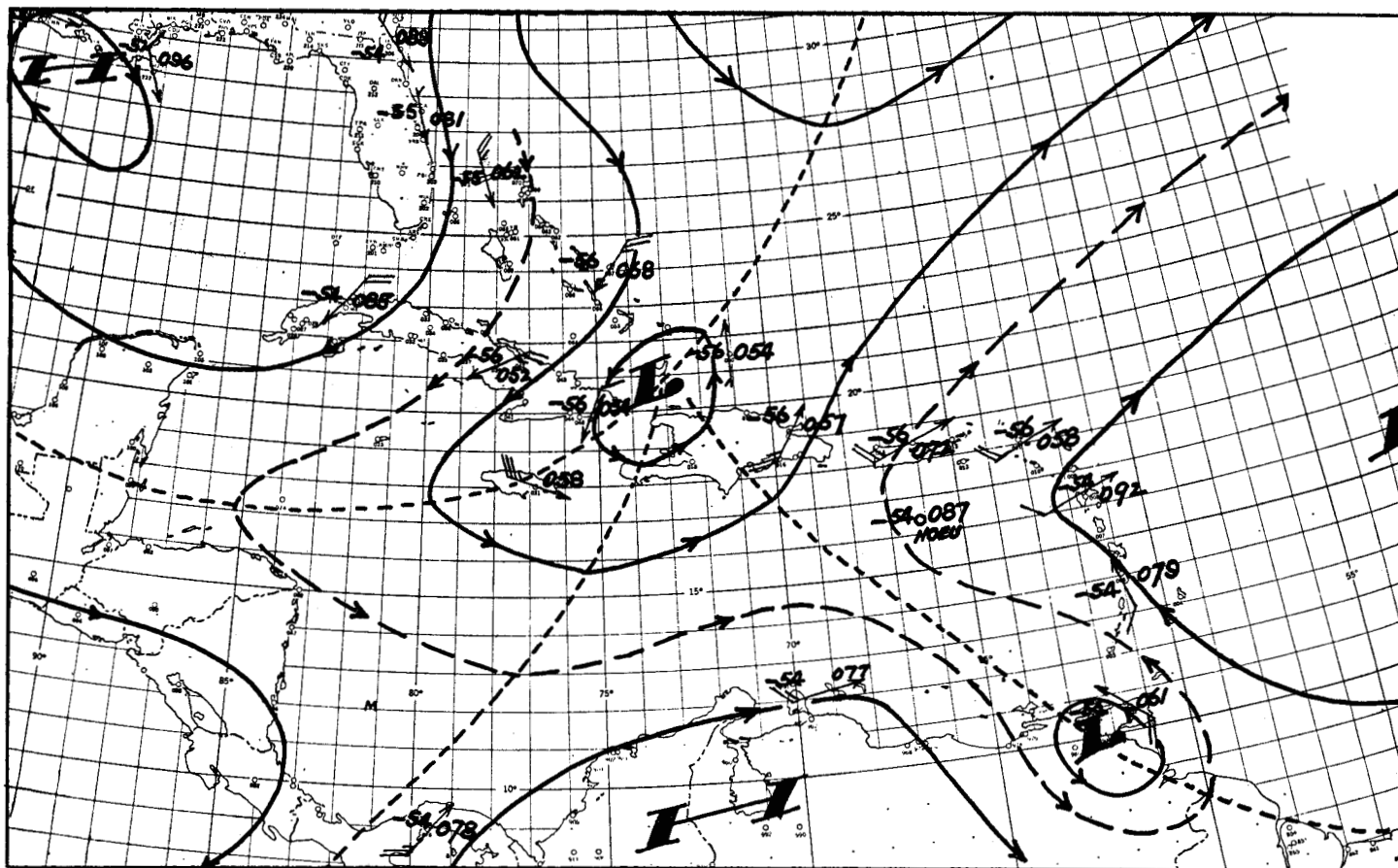


FIGURE 2.—200-mb. flow pattern, 0600 GMT July 20, 1957.

showed the continued presence of the surface perturbation. There was, however, no deepening from the previous day. Low-level reconnaissance by the U. S. Navy aircraft flying from Puerto Rico was successfully completed. The aircraft searched the area from an altitude of 500-1,000 feet. The winds reported were only of 20-25 kt.; pressures reported were rather high, but this was apparently due to failure to calibrate the altimeter before takeoff. When the correction was applied the reported pressures were in close agreement with vessel reports in the area. Significant radar echoes organized in bands extending east-west just north of the position of the surface Low were also reported. Vessel reports from the area showed also considerable weather. The report from the vessel *Nerita* located near 9.0° N., 55° W. was significant in that it confirmed the continued presence of a closed wind circulation. The perturbation showed motion toward the west-southwest from its position the previous day. In view of the changes in circulation at the 200-mb. level described above and study of the relative motion of the two centers, it is apparent that the low-level perturbation was moving into the rear section of the cyclonic cell at upper levels. This type of combination has been described in the literature as unfavorable for deepening (cf. Riehl ¹).

During the afternoon of July 18, at 1900 GMT (3 p. m. AST), a formal bulletin was issued. Although the perturbation had not shown significant deepening in the previous 24 hours and the consensus was that the situation was not favorable for deepening, it was thought that a precautionary notice to interests in the Lesser Antilles was warranted. There was also considerable demand for information in the eastern Caribbean area, since rumors

about suspicious weather situations spread rapidly. In the first bulletin the people in the Windward Islands were urged to stand a watch for further information. A second bulletin was issued at 7:00 p. m. AST (2300 GMT) and a third one at 6:00 a. m. (1000 GMT) next day, July 19. The watch was lifted in the third bulletin, since the situation offered no further danger.

The perturbation weakened after 2100 GMT on July 18. It continued its motion toward the west-southwest and moved inland over the eastern Venezuela-Guianas coastal area about 0900 GMT on July 19 attended by heavy shower and thunderstorm activity and winds of 20-25 kt.

During the period from July 17 to July 19, the system was watched and analyzed carefully for any signs of development. While attention was focused on the southern part of the easterly wave, where it joined the Intertropical Convergence Zone, possible development farther north in the upper portion of the wave axis was also under surveillance. Such types of situations are watched with considerable concern, since any hurricane developing in the northern portion of the easterly wave can affect the Lesser Antilles in a very short time, as was evidenced in the case of hurricane Janet of 1955.

Climatological statistics show that 13 storms formed in the eastern Atlantic area in July during the last 70 years. This indicates, of course, a low probability of formations, but on the other hand, shows that developments in that area during July are altogether possible. In the present case the conditions near the surface appeared to be similar to others in which storms have developed. Water temperatures throughout the period were of the order of 81°-83° F. which is sufficiently warm for development. The flow at upper levels apparently, was not favorable.—Ralph L. Higgs, Meteorologist in Charge, WBAS, San Juan, P. R.

¹ H. Riehl, *Tropical Meteorology*, McGraw-Hill Book Co., Inc., New York, 1954.

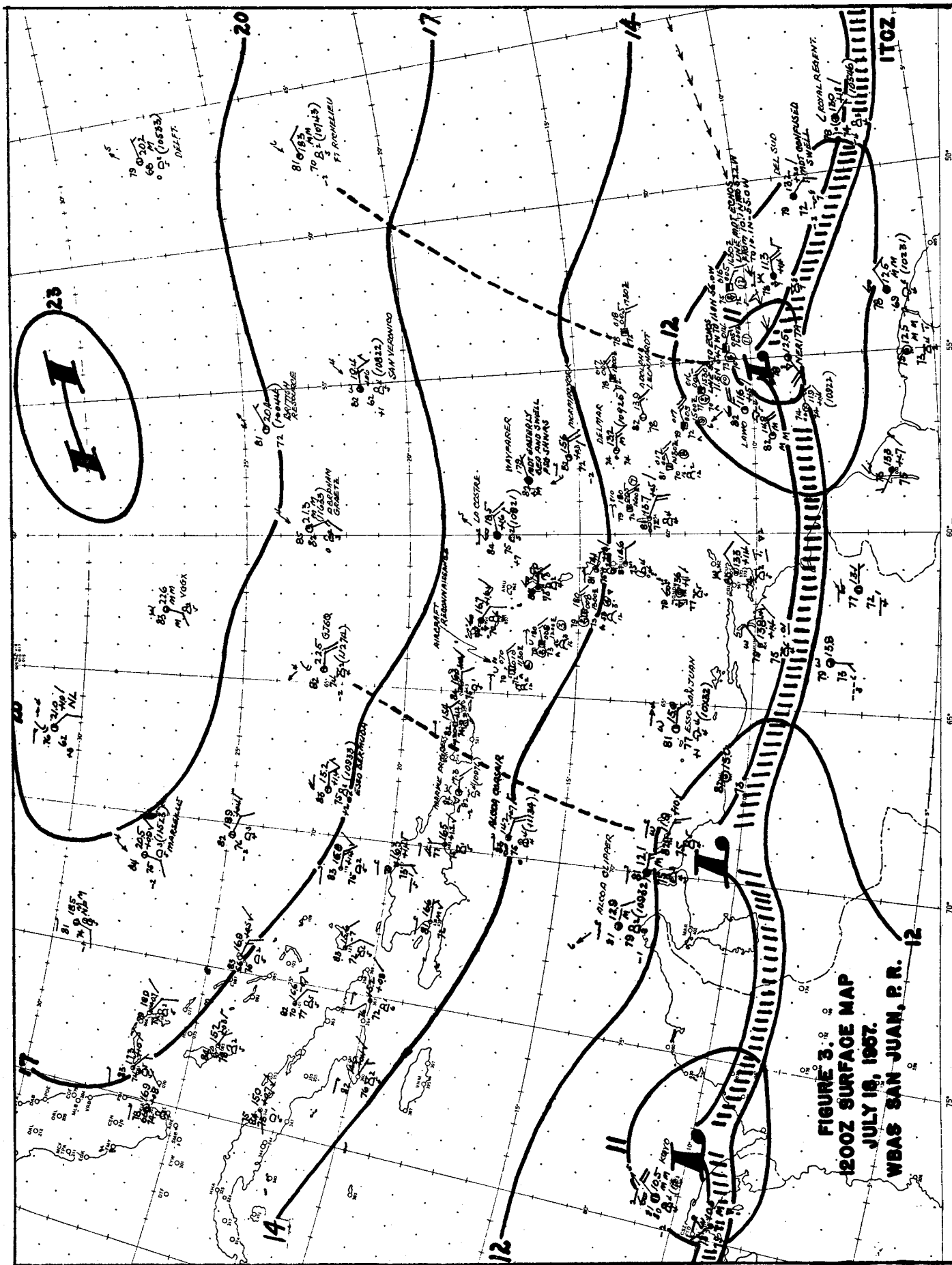


FIGURE 3.—Surface chart 1200 GMT July 18, 1957.